

REMARKS

The specification has been reviewed, and clerical errors of the specification have been amended.

On page 2 of the Action, claims 1-7, 9 and 12 were rejected under 35 U.S.C. 112, second paragraph. On pages 3-6 of the Action, claim 1-12 were rejected under 35 U.S.C. 102(b) or 35 U.S.C. 103(a) by Boulos et al., Nagashima et al. '122, Sakaguchi et al., Nagashima et al. '896 and Cheng et al.

In view of the rejections, claims 1-12 have been amended to clarify the features of the invention. Also, new claims 13 and 14 have been filed.

As clearly recited in amended claim 1, a glass composition of the invention comprises 65 wt.% to less than 74 wt.% SiO_2 ; 0-5 wt.% B_2O_3 ; 0.1-2.5 wt.% Al_2O_3 ; 0.4 to less than 2 wt.% MgO ; 5-15 wt.% CaO ; 0-10 wt.% SrO ; 0-10 wt.% BaO ; 0-5 wt.% Li_2O ; 10-18 wt.% Na_2O ; 0-5 wt.% K_2O ; and 0-0.40 wt.% TiO_2 . A total amount of Li_2O , Na_2O and K_2O is 10-20 wt.%.

In the invention, it is important that a total amount of MgO , CaO , SrO and BaO is greater than 10 wt.% to 15 wt.%. When 65 wt.% to less than 74 wt.% SiO_2 is mixed with 0.4 to less than 2 wt.% MgO and 10 wt.% to 15 wt.% of the total amount of MgO , CaO , SrO and BaO , the glass composition has good surface compressive stress without reinforcing process.

Namely, the invention is a specific combination of SiO_2 , MgO and the total of MgO , CaO , SrO and BaO . Also, the amounts of these materials are important. As a result, the glass composition has the good surface compressive stress without reinforcement in strength. Although the strength is improved, the glass composition of the invention can be formed in a regular float process.

In the present invention, the linear expansion coefficient and Young's modulus are improved by the specific combination and amounts of SiO_2 , MgO and the total amount of MgO , CaO , SrO and BaO .

A conventional soda-lime-silica glass has a linear expansion coefficient of $85-90 \times 10^{-7}/^\circ\text{C}$ and Young's Modulus of 71.6 GPa (7300

kg/mm²). Thus, the product of the linear expansion coefficient and Young's modulus is 0.61 to 0.64 MPa/°C. This value is less than the value of 0.71-0.90 MPa/°C as recited in claim 11 of the invention. This means that the glass composition of the invention in the specific ranges as recited in claim 1 has specific strength. Accordingly, the glass composition can provide a strengthened glass less than 3.1 mm, which is generally considered impossible.

Generally, it is known that as the linear expansion coefficient becomes greater, Young's modulus becomes smaller. Therefore, it is not easily attained to increase both linear expansion coefficient and Young's modulus, as in the invention.

In Boulos et al. a glass has 68-75 wt.% of SiO₂, 5-15 wt.% of CaO, and 0-10 wt.% of MgO.

In Nagashima et al. '122, a glass has 65-80 wt.% of SiO₂, 5-15 wt.% of CaO, and 0-10 wt.% of MgO, wherein MgO + CaO is 5-15 wt.%.

In Sakaguchi et al., a glass has 65-80 wt.% of SiO₂, 5-15 wt.% of CaO, and 0-10 wt.% of MgO, wherein MgO + CaO is 5-15 wt.%.

In Nagashima et al. '896, a glass has 65-80 wt.% of SiO₂, 5-15 wt.% of CaO, and 0-10 wt.% of MgO, wherein MgO + CaO is 5-15 wt.%.

In the above references, the range of SiO₂, CaO and MgO overlap with those of the invention. However, the invention is a specific combination and amounts of SiO₂, MgO and the total amount of MgO, CaO, SrO and BaO. As a result, the glass composition has the good surface compressive stress, and is reinforced in the strength. Although the strength is improved, the glass composition of the invention can be formed in a regular float process.

In the present invention, also, the linear expansion coefficient and Young's modulus are improved by the specific combination and amounts of SiO₂, MgO and the total amount of MgO, CaO, SrO and BaO.

The cited references show the regular soda-lime silica glass, and do not disclose the specific combination and the advantages of the invention. The linear expansion coefficient and Young's modulus are not considered at all in the cited references.

Therefore, the features of the invention are not disclosed or suggested in the cited references.

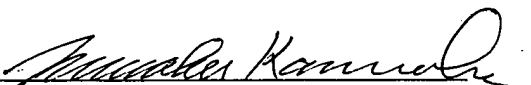
In Cheng et al., a glass contains typical soda-lime-silica glass batch ingredients, a cerium containing compound, total iron and carbon. Although the typical soda-lime-silica glass ingredients are used, the specific amounts of the ingredients of the invention are not disclosed or suggested in Cheng et al.

As explained above, the cited references simply disclose the general soda-lime-silica glass. Especially, in the invention, both linear expansion coefficient and Young's modulus are improved. The cited references do not disclose or suggest the improvements of the linear expansion coefficient and Young's modulus by using the specific amounts of the compounds, as recited in the claims of the invention. The invention is not disclosed or suggested in the cited references.

Reconsideration and allowance are earnestly solicited.

Respectfully Submitted,

KANESAKA AND TAKEUCHI

By 
Manabu Kanesaka
Reg. No. 31,467
Agent for Applicants

1423 Powhatan Street
Alexandria, VA 22314
(703) 519-9785